

What is claimed is:

1. A computer-implemented method for pricing, with adjustment for risk, of anticipated contract obligations comprising the steps of:
  - a) selecting a group of assets and liabilities,
  - b) assembling a series of potential future cashflow outcomes, with their respectively paired probabilities,
  - c) sorting the series of outcomes by their ascending cashflow values,
  - d) cumulating the probabilities of the sorted series of outcomes so that the last cumulative probability equals 1,
  - e) applying the inversion of the standard normal distribution to all cumulative probabilities, to provide individual inversely-mapped results,
  - f) selecting a lambda value as the market price of risk for the group of assets and liabilities,
  - g) shifting each inversely-mapped result by adding the selected lambda value,
  - h) applying the standard normal cumulative distribution to each shifted result, to create transformed cumulative probability weights,
  - i) decumulating the transformed cumulative probability weights so that the first decumulated weight equals the first cumulative weight, the second decumulated weight equals the second cumulative weight minus the first cumulative weight, the third decumulated weight equals the third cumulative weight minus the second cumulative weight, and so on, continuing until the last decumulated weight equals the last cumulative weight minus the next-to-last cumulative weight,

- j) multiplying the cashflow values to their respective decumulated probability weights to produce a set of weighted values, and
- k) adding the weighted values in the set to find an undiscounted price for the selected group of assets and liabilities.

2. The computer-implemented method of claim 1, further comprising the step of discounting the undiscounted price by the risk-free interest rate.

3. The computer-implemented method of claim 1, further comprising the step of iterating the lambda value, so that the undiscounted price is discounted by the risk-free interest rate, and converges to equal the last recorded outcome or quoted price, of that same asset or liability.

4. The computer-implemented method of claim 1, further comprising a process of applying a payoff function to each projected cashflow outcome of an asset or liability, the process comprising the additional steps of:

- a) applying the payoff function to each projected cashflow outcome of the underlying asset or liability,
- b) multiplying the resulting payoff values by their respective decumulated probability weights to produce a set of weighted values,
- c) adding these weighted values in the set to find an undiscounted price for the payoff function,
- d) discounting the undiscounted price by the risk-free interest rate.

5. The computer-implemented method of claim 1, wherein the assets and liabilities are traded.

6. The computer-implemented method of claim 5, wherein the traded assets and liabilities are selected from the group consisting of:

- a) stocks or other equity securities,
- b) bills, bonds, notes, or other debt securities,
- c) currencies of various countries,
- d) commodities of physical, agricultural, or financial delivery,
- e) asset-backed or liability-linked securities or contractual obligations,
- f) weather derivatives and other observable physical phenomena whose outcomes can be linked to financial outcomes.

7. The computer-implemented method of claim 6 wherein securitizations are backed by the traded assets and liabilities.

8. The computer-implemented method of claim 6 wherein derivatives, contingent claims, and payoff functions, are based on the traded assets and liabilities, as underlying financial instruments.

9. The computer-implemented method of claim 6 wherein the traded assets and liabilities, comprise the basis of published benchmarks, indexes, or collective experiences.
10. The computer-implemented method of claim 6 wherein the traded assets and liabilities, are managed in a portfolio, and risk management environment.
11. The computer-implemented method of claim 6 wherein the traded assets and liabilities, are managed for the purposes of capital allocation within economic entities.
12. The computer-implemented method of claim 1, wherein the assets and liabilities are underwritten.
13. The computer-implemented method of claim 12 wherein the underwritten assets and liabilities are selected from the group consisting of:
- a) insurance liabilities and reinsurance contracts,
  - b) insurance-linked contracts, and catastrophe bonds,
  - c) credit instruments, including loans, leases, mortgages, and credit cards,
  - d) account payables and receivables.
14. The computer-implemented method of claim 13 wherein securitizations are backed by the underwritten assets and liabilities.

15. The computer-implemented method of claim 13 wherein derivatives, contingent claims, and payoff functions, are based on the underwritten assets and liabilities, as underlying financial obligations.
16. The computer-implemented method of claim 13 wherein the underwritten assets and liabilities, comprise the basis of published benchmarks, indexes, or collective experiences.
17. The computer-implemented method of claim 13 wherein the underwritten assets and liabilities, are managed in a portfolio, within a risk management environment.
18. The computer-implemented method of claim 13 wherein the underwritten assets and liabilities, are measured for the purposes of capital allocation within economic entities.
19. The computer-implemented method of claim 13 wherein the underwritten assets and liabilities, are measured for cost of capital within economic entities.

20. The computer-implemented method of claim 1, wherein the (h) step specifying applying a standard normal distribution, is substituted, by applying a distribution selected from the group consisting of:

- a) a Student-t cumulative distribution,
- b) the cumulative distribution of a re-scaled Student-t distribution,
- c) a mixed-normal cumulative distribution,
- d) a lognormal cumulative distribution, and
- e) an empirically-constructed cumulative distribution.

21. A computer-implemented method for pricing, with adjustment for risk, and adjustment for parameter uncertainty, of anticipated contract obligations comprising the steps of:

- a) selecting a group of assets and liabilities,
- b) assembling a series of potential future cashflow outcomes, with their respectively paired probabilities,
- c) sorting the series of outcomes by their ascending cashflow values,
- d) cumulating the probabilities of the sorted series of outcomes so that the last cumulative probability equals 1,
- e) applying the inversion of the standard normal distribution to all cumulative probabilities, to provide individual inversely-mapped results,
- f) selecting a lambda value as the market price of risk for the group of assets and liabilities,
- g) shifting each inversely-mapped result by adding the selected lambda value,

- h) applying a Student-t cumulative distribution to each shifted result, to create transformed cumulative probability weights,
- i) decumulating the transformed cumulative probability weights so that the first decumulated weight equals the first cumulative weight, the second decumulated weight equals the second cumulative weight minus the first cumulative weight, the third decumulated weight equals the third cumulative weight minus the second cumulative weight, and so on, continuing until the last decumulated weight equals the last cumulative weight minus the next-to-last cumulative weight,
- j) multiplying the cashflow values to their respective decumulated probability weights to produce a set of weighted values, and
- k) adding the weighted values in the set to find an undiscounted price for the selected group of assets and liabilities.

22. The computer-implemented method of claim 21, further comprising the application of discounting the undiscounted price by the risk-free interest rate.

23. The computer-implemented method of claim 21, further comprising the step of iterating the lambda value, so that the undiscounted price is discounted by the risk-free interest rate, and converges to the last recorded outcome or quoted price, of that same asset or liability.

24. The computer-implemented method of claim 21, further comprising the step of iterating the number of degrees of freedom for the Student-t distribution, so that

the undiscounted price is discounted by the risk-free interest rate, and converges to the last recorded outcome or quoted price, of that same asset or liability.

25. The computer-implemented method of claim 21, further comprising the steps, of first, iterating the lambda value, and, of second, iterating the number of degrees of freedom for the Student-t distribution, in a sequence selected from the group consisting of:

- a) the first is iterated and fixed before the second is further iterated,
- b) the second is iterated and fixed before the first is further iterated,
- c) the first and second are iterated consecutively,
- d) the first and second are iterated simultaneously.

26. The computer-implemented method of claim 21, applying a payoff function to each projected outcome of an asset or liability, comprising the additional steps of:

- a) applying the payoff function to each projected outcome of the underlying asset or liability,
- b) multiplying the resulting payoff values by their respective decumulated probability weights to produce a set of weighted values,
- c) adding these weighted values in the set to find an undiscounted price for the payoff function,
- d) discounting the undiscounted price by the risk-free interest rate.



27. The computer-implemented method of claim 21, wherein the assets and liabilities are traded.

28. The computer-implemented method of claim 27, wherein the traded assets and liabilities are selected from the group consisting of:

- a) stocks or other equity securities,
- b) bills, bonds, notes, or other debt securities,
- c) currencies of various countries,
- d) commodities of physical, agricultural, or financial delivery,
- e) asset-backed or liability-linked securities or contractual obligations,
- f) weather derivatives and other observable physical phenomena whose outcomes can be linked to financial outcomes.

29. The computer-implemented method of claim 28 wherein securitizations are backed by the traded assets and liabilities.

30. The computer-implemented method of claim 28 wherein derivatives, contingent claims, and payoff functions, are based on the traded assets and liabilities, as underlying financial instruments.

31. The computer-implemented method of claim 28 wherein the traded assets and liabilities, comprise the basis of published benchmarks, indexes, or collective experiences.

32. The computer-implemented method of claim 28 wherein the traded assets and liabilities, are managed in a portfolio, and risk management environment.

33. The computer-implemented method of claim 28 wherein the traded assets and liabilities, are managed for the purposes of capital allocation within economic entities.

34. The computer-implemented method of claim 21, wherein the assets and liabilities are underwritten.

35. The computer-implemented method of claim 34 wherein the underwritten assets and liabilities are selected from the group consisting of:

- a) insurance liabilities and reinsurance contracts,
- b) insurance-linked contracts, and catastrophe bonds,
- c) credit instruments, including loans, leases, mortgages, and credit cards,
- d) account payables and receivables.

36. The computer-implemented method of claim 35 wherein securitizations are backed by the underwritten assets and liabilities.

37. The computer-implemented method of claim 35 wherein derivatives, contingent claims, and payoff functions, are based on the underwritten assets and liabilities, as underlying financial obligations.
38. The computer-implemented method of claim 35 wherein the underwritten assets and liabilities, comprise the basis of published benchmarks, indexes, or collective experiences.
39. The computer-implemented method of claim 35 wherein the underwritten assets and liabilities, are managed in a portfolio, within a risk management environment.
40. The computer-implemented method of claim 35 wherein the underwritten assets and liabilities, are measured for the purposes of capital allocation within economic entities.
41. The computer-implemented method of claim 35 wherein the underwritten assets and liabilities, are measured for cost of capital within economic entities.
42. A computer-readable medium for use with a computer means for pricing, with adjustment for risk, of anticipated contract obligations comprising the steps of:
- a) selecting a group of assets and liabilities,

- b) assembling a series of potential future cashflow outcomes, with their respectively paired probabilities,
- c) sorting the series of outcomes by their ascending cashflow values,
- d) cumulating the probabilities of the sorted series of outcomes so that the last cumulative probability equals 1,
- e) applying the inversion of the standard normal distribution to all cumulative probabilities, to provide individual inversely-mapped results,
- f) selecting a lambda value as the market price of risk for the group of assets and liabilities,
- g) shifting each inversely-mapped result by adding the selected lambda value,
- h) applying the standard normal cumulative distribution to each shifted result, to create transformed cumulative probability weights,
- i) decumulating the transformed cumulative probability weights so that the first decumulated weight equals the first cumulative weight, the second decumulated weight equals the second cumulative weight minus the first cumulative weight, the third decumulated weight equals the third cumulative weight minus the second cumulative weight, and so on, continuing until the last decumulated weight equals the last cumulative weight minus the next-to-last cumulative weight,
- j) multiplying the cashflow values to their respective decumulated probability weights to produce a set of weighted values, and

- k) adding the weighted values in the set to find an undiscounted price for the selected group of assets and liabilities.

43. The computer-readable medium for use with a computer means of claim 42, further comprising the step of discounting the undiscounted price by the risk-free interest rate.

44. The computer-readable medium for use with a computer means of claim 42, further comprising the step of iterating the lambda value, so that the undiscounted price is discounted by the risk-free interest rate, and converges to equal the last recorded outcome or quoted price, of that same asset or liability.

45. The computer-readable medium for use with a computer means of claim 42, further comprising a process of applying a payoff function to each projected cashflow outcome of an asset or liability, the process comprising the additional steps of:

- a) applying the payoff function to each projected cashflow outcome of the underlying asset or liability,
- b) multiplying the resulting payoff values by their respective decumulated probability weights to produce a set of weighted values,
- c) adding these weighted values in the set to find an undiscounted price for the payoff function,
- d) discounting the undiscounted price by the risk-free interest rate.

46. The computer-readable medium for use with a computer means of claim 42, wherein the assets and liabilities are traded.

47. The computer-readable medium for use with a computer means of claim 46, wherein the traded assets and liabilities are selected from the group consisting of:

- a) stocks or other equity securities,
- b) bills, bonds, notes, or other debt securities,
- c) currencies of various countries,
- d) commodities of physical, agricultural, or financial delivery,
- e) asset-backed or liability-linked securities or contractual obligations,
- f) weather derivatives and other observable physical phenomena whose outcomes can be linked to financial outcomes.

48. The computer-readable medium for use with a computer means of claim 47 wherein securitizations are backed by the traded assets and liabilities.

49. The computer-readable medium for use with a computer means of claim 47 wherein derivatives, contingent claims, and payoff functions, are based on the traded assets and liabilities, as underlying financial instruments.

50. The computer-readable medium for use with a computer means of claim 47

wherein the traded assets and liabilities, comprise the basis of published benchmarks, indexes, or collective experiences.

51. The computer-readable medium for use with a computer means of claim 47

wherein the traded assets and liabilities, are managed in a portfolio, and risk management environment.

52. The computer-readable medium for use with a computer means of claim 47

wherein the traded assets and liabilities, are managed for the purposes of capital allocation within economic entities.

53. The computer-readable medium for use with a computer means of claim 42,

wherein the assets and liabilities are underwritten.

54. The computer-readable medium for use with a computer means of claim 53

wherein the underwritten assets and liabilities are selected from the group consisting of:

- a) insurance liabilities and reinsurance contracts,
- b) insurance-linked contracts, and catastrophe bonds,
- c) credit instruments, including loans, leases, mortgages, and credit cards,
- d) account payables and receivables.

55. The computer-readable medium for use with a computer means of claim 54 wherein securitizations are backed by the underwritten assets and liabilities.
56. The computer-readable medium for use with a computer means of claim 54 wherein derivatives, contingent claims, and payoff functions, are based on the underwritten assets and liabilities, as underlying financial obligations.
57. The computer-readable medium for use with a computer means of claim 54 wherein the underwritten assets and liabilities, comprise the basis of published benchmarks, indexes, or collective experiences.
58. The computer-readable medium for use with a computer means of claim 54 wherein the underwritten assets and liabilities, are managed in a portfolio, within a risk management environment.
59. The computer-readable medium for use with a computer means of claim 54 wherein the underwritten assets and liabilities, are measured for the purposes of capital allocation within economic entities.
60. The computer-readable medium for use with a computer means of claim 54 wherein the underwritten assets and liabilities, are measured for cost of capital within economic entities.



61. The computer-readable medium for use with a computer means of claim 42, wherein the (h) step specifying applying a standard normal distribution, is substituted, by applying a distribution selected from the group consisting of:

- a) a Student-t cumulative distribution,
- b) the cumulative distribution of a re-scaled Student-t distribution,
- c) a mixed-normal cumulative distribution,
- d) a lognormal cumulative distribution, and
- e) an empirically-constructed cumulative distribution.

62. A computer-readable medium for use with a computer means for pricing, with adjustment for risk, and adjustment for parameter uncertainty, of anticipated contract obligations comprising the steps of:

- a) selecting a group of assets and liabilities,
- b) assembling a series of potential future cashflow outcomes, with their respectively paired probabilities,
- c) sorting the series of outcomes by their ascending cashflow values,
- d) cumulating the probabilities of the sorted series of outcomes so that the last cumulative probability equals 1,
- e) applying the inversion of the standard normal distribution to all cumulative probabilities, to provide individual inversely-mapped results,
- f) selecting a lambda value as the market price of risk for the group of assets and liabilities,

- g) shifting each inversely-mapped result by adding the selected lambda value,
- h) applying a Student-t cumulative distribution to each shifted result, to create transformed cumulative probability weights,
- i) decumulating the transformed cumulative probability weights so that the first decumulated weight equals the first cumulative weight, the second decumulated weight equals the second cumulative weight minus the first cumulative weight, the third decumulated weight equals the third cumulative weight minus the second cumulative weight, and so on, continuing until the last decumulated weight equals the last cumulative weight minus the next-to-last cumulative weight,
- j) multiplying the cashflow values to their respective decumulated probability weights to produce a set of weighted values, and
- k) adding the weighted values in the set to find an undiscounted price for the underwritten group.

63. The computer-readable medium for use with a computer means of claim 62, further comprising the application of discounting the undiscounted price by the risk-free interest rate.

64. The computer-readable medium for use with a computer means of claim 62, further comprising the step of iterating the lambda value, so that the undiscounted

price is discounted by the risk-free interest rate, and converges to the last recorded outcome or quoted price, of that same asset or liability.

65. The computer-readable medium for use with a computer means of claim 62, further comprising the step of iterating the number of degrees of freedom for the Student-t distribution, so that the undiscounted price is discounted by the risk-free interest rate, and converges to the last recorded outcome or quoted price, of that same asset or liability.

66. The computer-readable medium for use with a computer means of claim 62, further comprising the steps, of first, iterating the lambda value, and, of second, iterating the number of degrees of freedom for the Student-t distribution, in a sequence selected from the group consisting of:

- a) the first is iterated and fixed before the second is further iterated,
- b) the second is iterated and fixed before the first is further iterated,
- c) the first and second are iterated consecutively,
- d) the first and second are iterated simultaneously.

67. The computer-readable medium for use with a computer means of claim 62, applying a payoff function to each projected outcome of an asset or liability, comprising the additional steps of:

- a) applying the payoff function to each projected outcome of the underlying asset or liability,

- b) multiplying the resulting payoff values by their respective decumulated probability weights to produce a set of weighted values,
- c) adding these weighted values in the set to find an undiscounted price for the payoff function,
- d) discounting the undiscounted price by the risk-free interest rate.

68. The computer-readable medium for use with a computer means of claim 62, wherein the assets and liabilities are traded.

69. The computer-readable medium for use with a computer means of claim 68, wherein the traded assets and liabilities are selected from the group consisting of:

- a) stocks or other equity securities,
- b) bills, bonds, notes, or other debt securities,
- c) currencies of various countries,
- d) commodities of physical, agricultural, or financial delivery,
- e) asset-backed or liability-linked securities or contractual obligations,
- f) weather derivatives and other observable physical phenomena whose outcomes can be linked to financial outcomes.

70. The computer-readable medium for use with a computer means of claim 69 wherein securitizations are backed by the traded assets and liabilities.

71. The computer-readable medium for use with a computer means of claim 69 wherein derivatives, contingent claims, and payoff functions, are based on the traded assets and liabilities, as underlying financial instruments.
72. The computer-readable medium for use with a computer means of claim 69 wherein the traded assets and liabilities, comprise the basis of published benchmarks, indexes, or collective experiences.
73. The computer-readable medium for use with a computer means of claim 69 wherein the traded assets and liabilities, are managed in a portfolio, and risk management environment.
74. The computer-readable medium for use with a computer means of claim 69 wherein the traded assets and liabilities, are managed for the purposes of capital allocation within economic entities.
75. The computer-readable medium for use with a computer means of claim 62, wherein the assets and liabilities are underwritten.
76. The computer-readable medium for use with a computer means of claim 75 wherein the underwritten assets and liabilities are selected from the group consisting of:
  - a) insurance liabilities and reinsurance contracts,

- b) insurance-linked contracts, and catastrophe bonds,
- c) credit instruments, loans, leases, mortgages, and credit cards,
- d) account payables and receivables.

77. The computer-readable medium for use with a computer means of claim 76 wherein securitizations are backed by the underwritten assets and liabilities.

78. The computer-readable medium for use with a computer means of claim 76 wherein derivatives, contingent claims, and payoff functions, are based on the underwritten assets and liabilities, as underlying financial obligations.

79. The computer-readable medium for use with a computer means of claim 76 wherein the underwritten assets and liabilities, are the basis of published benchmarks, indexes, or collective experiences.

80. The computer-readable medium for use with a computer means of claim 76 wherein the underwritten assets and liabilities, are managed in a portfolio, within a risk management environment.

81. The computer-readable medium for use with a computer means of claim 76 wherein the underwritten assets and liabilities, are measured for the purposes of capital allocation within economic entities.

82. The computer-readable medium for use with a computer means of claim 76 wherein the underwritten assets and liabilities, are measured for cost of capital within economic entities.

83. A computer-implemented method for calibrating the market price of risk, of anticipated contract obligations comprising the steps of:

- a) selecting a group of assets and liabilities,
- b) assembling a series of potential future cashflow outcomes, with their respectively paired probabilities,
- c) sorting the series of outcomes by their ascending cashflow values,
- d) cumulating the probabilities of the sorted series of outcomes so that the last cumulative probability equals 1,
- e) applying the inversion of the standard normal distribution to all cumulative probabilities, to provide individual inversely-mapped results,
- f) selecting a lambda value as the market price of risk for the group of assets and liabilities,
- g) shifting each inversely-mapped result by adding the selected lambda value,
- h) applying the standard normal cumulative distribution to each shifted result, to create transformed cumulative probability weights,

- i) decumulating the transformed cumulative probability weights so that the first decumulated weight equals the first cumulative weight, the second decumulated weight equals the second cumulative weight minus the first cumulative weight, the third decumulated weight equals the third cumulative weight minus the second cumulative weight, and so on, continuing until the last decumulated weight equals the last cumulative weight minus the next-to-last cumulative weight,
- j) multiplying the cashflow values to their respective decumulated probability weights to produce a set of weighted values, and
- k) adding the weighted values in the set to find an undiscounted price for the selected group of assets and liabilities,
- l) discounting the undiscounted price for the selected group of assets and liabilities,
- m) determining that, if the discounted price is equal to the last outcome, or last quoted price, for the selected group, the provisional lambda value is accepted as the market price of risk;
- n) determining that, if the discounted price is not equal to the last outcome, or last quoted price, for the selected group, the provisional lambda value is not accepted as the market price of risk;
- o) iterating any provisional lambda value that is not accepted as the market price of risk, until the discounted price for the selected group is equal to the last outcome, or last quoted price, for the selected group.



84. The computer-implemented method of claim 83 wherein respective measurements of market prices of risk for different assets and liabilities, comprise the basis of published benchmarks, indexes, or collective experiences.

85. A computer-readable medium for use with a computer means for calibrating the market price of risk, of anticipated contract obligations comprising the steps of:

- a) selecting a group of assets and liabilities,
- b) assembling a series of potential future cashflow outcomes, with their respectively paired probabilities,
- c) sorting the series of outcomes by their ascending cashflow values,
- d) cumulating the probabilities of the sorted series of outcomes so that the last cumulative probability equals 1,
- e) applying the inversion of the standard normal distribution to all cumulative probabilities, to provide individual inversely-mapped results,
- f) selecting a lambda value as the market price of risk for the group of assets and liabilities,
- g) shifting each inversely-mapped result by adding the selected lambda value,

- h) applying the standard normal cumulative distribution to each shifted result, to create transformed cumulative probability weights,
- i) decumulating the transformed cumulative probability weights so that the first decumulated weight equals the first cumulative weight, the second decumulated weight equals the second cumulative weight minus the first cumulative weight, the third decumulated weight equals the third cumulative weight minus the second cumulative weight, and so on, continuing until the last decumulated weight equals the last cumulative weight minus the next-to-last cumulative weight,
- j) multiplying the cashflow values to their respective decumulated probability weights to produce a set of weighted values, and
- k) adding the weighted values in the set to find an undiscounted price for the selected group of assets and liabilities,
- l) discounting the undiscounted price for the selected group,
- m) determining that, if the discounted price is equal to the last outcome, or last quoted price, for the selected group, the provisional lambda value is accepted as the market price of risk;
- n) determining that, if the discounted price is not equal to the last outcome, or last quoted price, for the selected group, the provisional lambda value is not accepted as the market price of risk;
- o) iterating any provisional lambda value that is not accepted as the market price of risk, until the discounted price for the selected group is equal to the last outcome, or last quoted price, for the selected group.

86. The computer-readable medium for use with a computer method of claim 85 wherein respective measurements of market prices of risk for different assets and liabilities, comprise the basis of published benchmarks, indexes, or collective experiences.